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SCIENCE

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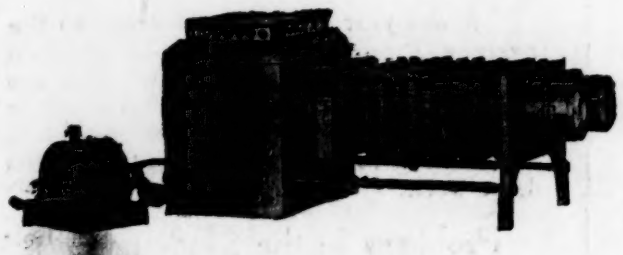

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BIOLOGY AND WAR[1]

1. BIOLOGY is not the science which can throw any light on the origin of war, since wars are caused by economic, political and social conditions. Although these conditions are in the last analysis based upon human instincts it does not seem profitable for the present to trace the connection.

It is also outside the speaker's problem to discuss the effects of war. Compared with the misery and anguish, the general loss of life and of liberty, and the economic waste caused by war, the possible hereditary effects on the population, if there are any, are too trivial to be mentioned.

As far as your speaker has been able to see, biology can at present offer a contribution to the problem of war in one direction only, namely to test some of the claims of war enthusiasts who insist that from a biological viewpoint wars are justifiable or even desirable.

2. These war enthusiasts maintain that unless a nation engages occasionally in war it will lose all those virile virtues, especially courage, which are necessary for its survival. We do not need to argue whether the acts committed in a state of homicidal emotion are the real or only manifestations of courage; we may also overlook the manifestations of virility left behind by invading or retreating armies. The assumption that virility or courage (whatever may be meant by these terms) will disappear if not practised in the form of war implies an unproven and apparently false biological assumption, namely, that functions not practised or organs not used will disappear

[1] Read at the meeting of Naturalists, December 29, 1916.

in the offspring. Such arguments were very common in biology before the experimental method was recognized as necessary to test the validity of our assumptions. Since experimental tests were made we have learned that eyes do not degenerate when animals are kept in the dark. Thus Payne raised sixty-nine successive generations of *Drosophila* in the dark without noticing any trace of degeneracy in the eye or its function. Uhlenhuth found that eyes when transplanted into the back of salamanders will (after a transitory degeneration) regenerate completely, and remain normal no matter whether the animals are kept in the dark or in the light. Hereditary blindness (*e. g.*, hereditary glaucoma in man) is apparently due to a mutation (probably a chemical change in one chromosome) which originates, as far as our present facts show, independently of use or disuse of the eye. We know through Morgan's observations that insects with mutilated or rudimentary wings may arise suddenly as mutations from parents which used their wings. Lack of the practise of flying does according to our present knowledge no more lead to the hereditary disappearance of wings than darkness leads to hereditary degeneration of the eyes. The statement, that a nation by not going to war will lose any of its inherited "virile virtues" is not supported by our present biological knowledge.

3. The biology of which the war enthusiasts make use is essentially antiquated, and so we need not be surprised to find that they consider war to be based on what they call the "biological law of nature," the "struggle for existence," or the "survival of the fittest." Such ideas are expressed by war enthusiasts in America as well as in Europe and we may be permitted to make the following quotation without giving the name of its author.

> **The struggle for existence is in the life of nature the basis of all healthy development. All existing things show themselves to be the result of contesting forces. So in the life of man the struggle is not merely the destructive but the life-giving principle. . . . The law of the stronger holds good everywhere. Those forms survive which are able to procure for themselves the most favorable conditions of life and to assert themselves in the universal economy of nature. The weaker succumb. This struggle is regulated and restrained by the unconscious sway of biological laws and by the interplay of opposite forces. In the plant world and the animal world this process is worked out in unconscious tragedy. In the human race it is consciously carried out, and regulated by social ordinances. The man of strong will and strong intellect tries by every means to assert himself, . . . and in this effort the individual is far from being guided merely by the consciousness of right. . . . The nation is made up of individuals. . . . The motive which influences each member is prominent in the whole body. It is a persistent struggle for possessions . . . and right is respected so far only as it is compatible with advantage.**

The "struggle for existence" and the "survival of the fittest" are no "laws of nature" in the sense in which the term law is used in the exact sciences. We speak of a law of nature when we are able to express a phenomenon as a mathematical function of its variables. We thus speak of a law of gravitation, of Ohm's law, or in biology of Mendel's law of segregation. As long as biologists did not realize that their statements needed not only a qualitative experimental test but also a quantitative verification they talked in a loose way, and this did not change until the methods of physics and physical chemistry began to invade biological research. The progress made by Mendel lay in this, that he introduced the quantitative method of the physicist into the investigations of hybridization and he was ignored because the zoologists and botanists of his time did not grasp the fact that the progress of science depends upon the invention or application of such methods.

The terms "survival of the fittest" or "struggle for existence" were never more than poor metaphors to express the fact that the chemical compounds required for the growth of organisms are restricted in quantity and that as a consequence unlimited reproduction of organisms is impossible. Aside from the limitation of food, the physical conditions (*e. g.*, too low or too high a temperature) existing on the different parts of the globe, act as a restricting influence. The methods by which the stronger "conquer" weaker nations have nothing in common with the fact that salt water fish die when put into fresh water or that microorganisms can not multiply unless they have their proper culture medium. The majority of organisms, *e. g.*, plants, bacteria of the soil, and many others, can in no way be called predatory organisms. Of course, there are animals which are as brutal and predatory as the war enthusiasts think human beings should be—but this is a different thing from calling this brutality a universal law of living nature. Fortunately the normal human being does not belong to this brutal type.

There is a wide quantitative difference in the development of instincts and of the power of inhibition in different human individuals, and these differences may be hereditary. Individuals with a strong homicidal mania, who just manage to suppress their paranoic tendencies, will welcome war since it removes for them the burden of constant inhibition, and unfortunately such poorly balanced individuals have rather too frequently been the leaders of governments. No human society can be expected to exist unless the necessity of suppressing or curbing the harmful and pathological instincts of individuals is recognized, and a nation is liable to pay a high price for the privilege of having a semipathological individual at the head of its government.

4. The war enthusiasts also derive from what they are pleased to call the "law of nature" the statement that "superior races" have the right of impressing their civilization upon "inferior races." The information concerning the relative value of races is furnished by a group of writers who call themselves "racial biologists." This "racial biology" is based on quotations from the erudite statements of theologians, philologists, historians, politicians, anthropologists, and also occasionally of biologists, especially of the nonexperimenting type. The method of standardizing the different races is consequently neither quantitative nor experimental, for, as the best known "race biologist," Houston Chamberlain, says, "there is something in the world besides compass and yard measure. Where the learned fails with his artificial construction, one single unbiased glance can illuminate the truth like a sunbeam." A few quotations from Chamberlain will show how this method of "sunbeams" is applied in special cases. Thus Chamberlain tries to prove that the Celtic Bretons in France are really Germanic.

> These Celtic minds of former centuries, teeming with strength, are not merely free and not merely pious any more than the Breton seamen of to-day, but they are both free and pious and it is this very combination that expresses what is specifically Germanic, as we observe it from Charlemagne to Queen Louise.

And as a sop to biology, Chamberlain states:

> Let us therefore not be in too great a hurry to assert that Germanicism does not lie in blood; it does lie in it; not in the sense that this blood guarantees Germanic sentiment and capacity but that it makes these possible. This limitation is therefore a very clear one: as a rule that man is Germanic who is descended from Germanic ancestors.

It will not be necessary at a meeting of biologists to state that Mendelian characters are generally inherited singly and in-

dependently, and that we know nothing about the inheritance of piety and freedom, either separately or in Germanic linkage. The writer wishes also to apologize for being compelled to point out that it is not good biology to maintain that the oblique eyes of the Chinese or Japanese are an indication of an oblique character, or that in a hybrid the "bad" qualities of the parents are dominant over the "good" ones.

5. While the statements of the war enthusiasts will not be taken seriously by those familiar with the methods and results of experimental biology, the sad fact remains that this pseudobiology has had at least a share in the production of the tragedy which is being enacted in Europe. For wars are impossible unless the masses are aroused to a state of emotionalism and fanaticism, and the pseudobiology of literateurs and politicians may serve this purpose in the future as it has in the past. The government has at last begun to realize that it is its duty to protect the masses from the medical quack. Your speaker is of the opinion that the masses need equal protection from the irresponsible literateur or politician who makes it his business to spread the seed of fanaticism and emotionalism by a claim of knowledge of biology which he does not possess. The cure for this form of pernicious mischief is the spread of knowledge of the exact sciences which will put an end to the business of the pseudoscientist.

Since at present the making of war is left in the hands of the statesmen, it may be well to mention at least that the exact sciences have paved the way for the replacement of the present type of statesmanship by a new one; according to which statesmanship consists in the application of the results of the exact sciences to the improvement of the lot of humanity. This includes not only the technical but also the theoretical results of science, since these theoretical results will free the minds from all those forms of ignorance, superstition and fanaticism which are the culture medium of mob emotionalism. If we succeed in substituting for the present a new type of statesmen, who are familiar with and follow the development of the *exact*—*i. e.*, the experimental and quantitative—sciences, and who are willing and capable of applying the results of exact science to the intellectual, moral, physical and economical uplift of the masses, we shall at least diminish the danger of war.

Jacques Loeb
The Rockefeller Institute for Medical Research,
New York

ASYMMETRIC SYNTHESES AND THEIR BEARING ON THE DOCTRINE OF VITALISM. II

The fact that an asymmetric compound prepared in the laboratory is always obtained in the inactive form is in itself of no great significance. As has been already stated, the result is just what one would expect. It assumes its significance, however, when taken in conjunction with the fact that an asymmetric compound occurring in nature, with very rare exceptions, exists in the active form. In other words, it is the difference between the results of the laboratory synthesis and those of nature that impart to this general subject its remarkable interest.

The view that the production of the active forms of asymmetric compounds is characteristic of living organisms was advanced first by Pasteur. The following quotations are taken from his lecture delivered before the Chemical Society of Paris in 1860.

> All artificial bodies and all minerals have superposable images. Opposed to these are many organic substances (I might say nearly all, if I were

to specify only those which play an important rôle in plant and animal life) all of which are important substances to life, are asymmetric, and indeed have the kind of asymmetry in which the image is not superposable with the object. . . . When I assert that no artificial substances with molecular asymmetry are known, I speak of artificial substances in the proper sense of the word, which are formed in all their parts from the elements, or are produced from bodies which are not asymmetric. . . . In this way the idea of the influence of the molecular asymmetry of natural organic products is introduced into physiological studies; this important characteristic is perhaps the only distinct line of demarkation which we can draw to-day between dead and living nature.

This view originally advanced by Pasteur is now so firmly established that no chemist would hesitate to take it into consideration in determining the origin of naturally occurring products. For example, it is a well-known fact that certain mineral oils found in nature are optically active and Walden, Engler and other investigators have contended that because of this property, these oils must be regarded as of organic rather than mineral origin.

The question that concerns us, however, is whether this inability to reproduce in the laboratory the results which are obtained in the living organism is due to a complete difference between the methods of the laboratory and those of nature, or whether it is due simply to lack of knowledge as to the conditions necessary for effecting the synthesis. It is evident that Pasteur inclined to the latter belief. In one of his lectures, after emphasizing that only the dextro or levo forms are produced in nature, he adds:

But why right and left molecules, why not only symmetrical molecules like those of the inorganic substances? There are certainly causes for this remarkable behavior of the molecular forces, even though it is difficult for us to get a clear conception of them. I believe that I am not deceived when I assert that we now know one of its most important characteristics. Is it not necessary and also sufficient to assume that the instant the plant organism arises an asymmetric force is active? For we have seen above that the dextro-molecule deviates from its levo-antipode only in those cases in which it is subjected to some kind of an asymmetric action. Do such asymmetric agencies arise from the cosmic influences, light, electricity, magnetism, heat? Do they perhaps stand in close relation with the earth movements, with the electric current by means of which physicists explain the earth's magnetic pole.

Pasteur put his beliefs to the test by attempting to bring about asymmetric syntheses through the agency of the magnetic field as well as of polarized light.

It is evident that nature may act in one of two ways in building up active forms. In the first place asymmetric forces may be present of which we have no knowledge, through whose influence a single active form may be built up; or both of the active forms may result just as in our laboratory synthesis but, through some agency unknown to us, one of these forms may be used up by the organism or destroyed as fast as formed. The latter view is the one most generally accepted. Attention was called to the plausibility of this view by Fischer in a lecture delivered before the German Chemical Society in 1890. In this lecture after calling attention to the fact that only the active sugars of the dextro-mannite series are found in plants, Fischer adds:

Are these the only products of assimilation? Is the preparation of optically active substances a prerogative of the living organism? Is there brought into action here a special cause, a kind of life force? I think not, and incline much more to the view that only the incompleteness of our knowledge imparts to such processes the appearance of the miraculous.

No known facts are opposed to the view that the plant, just as in chemical synthesis, produces at first both forms, that it then separates the two and that it uses the members of the *d*-mannite series for the formation of starch, cellulose, inulin, etc., while the optical isomers serve for some other yet unknown purpose.

While Fischer's explanation may appear plausible, nevertheless the fact that no

complete asymmetric synthesis has as yet ever been accomplished, notwithstanding the repeated efforts of many of our most skilful workers, has led some scientists to the belief that the problem does not admit of solution; that there exists in the organism some vital force or agency which directs the manner of combination of the atoms in the molecule and that this force is not reproducible in the laboratory. Such scientists, therefore, find in the facts of asymmetric syntheses an argument in support of the doctrine of vitalism—that doctrine which postulates that life is not the result of physical and chemical forces merely, but that these forces are guided through the directing agency of some vital force that comes into action with the life of the organism.

The advocates of the doctrine of vitalism criticize the assumption of Fischer cited above, on the ground that the destruction of one of the forms of an asymmetric compound partakes just as much of the miraculous as does the production of one of the forms alone; for with one possible exception the methods for accomplishing the separation require the use of already existing optically active substances. The exception referred to is the mechanical method, which is applicable, however, only when the two forms are solid compounds and separate from their solutions in crystals that are related to each other as object to image—a property which is possessed by the salts of the racemic tartaric acid. In all such cases it is readily possible to separate the two forms from each other mechanically, as Pasteur did in his original discovery. The opponents of the doctrine of vitalism hold that this constitutes a complete asymmetric synthesis; that starting with inactive substances, optically active forms have been obtained separate from each other without the use of previously existing optically active compounds, and without in any way employing the agency of life. To the vitalist, however, the action of the investigator in separating the two forms of crystals from each other is exactly similar to the action of an enzyme which destroys the one form and leaves the other in a pure state. This view is expressed by Professor Japp as follows:

> It requires the living operator, whose intellect embraces the conception of opposite forms of asymmetry, to separate them (*i. e.*, the two forms of crystals). Such a process can not, by any stretch of language, be termed "mechanical." Conscious selection here produces the same result as the unconscious selection exercised by the micro-organism, the enzyme, or the previously existing asymmetric compound. . . . Only the living organism with its asymmetric tissues, or the asymmetric products of the living organism, or the living intelligence with its conception of asymmetry, can produce this result. Only asymmetry can beget asymmetry.

I can give no better summation of the views of the opposite schools of thought in regard to the bearing of the subject of asymmetric syntheses upon the doctrine of vitalism than to sum up briefly the main arguments advanced by Professor Japp in an address delivered before the British Association in 1898, as well as the arguments advanced by those who criticized the address. This latter number includes such eminent scientific men as Pearson, Spencer, Frankland, Armstrong, Fitzgerald, Errara, Kipping and Pope.

Japp bases his arguments largely upon the fact that all attempts to effect asymmetric syntheses without the intervention of life either directly or indirectly, have been futile. Neither does he think our failure to do so is due to "a temporary disability which the progress of science may remove." He calls attention to the fact that all the methods that have been used for separating a racemic form into its active constituents employed living agencies either directly or

indirectly. He likewise emphasizes the fact that all attempts to utilize the magnetic field and polarized light have met with failure and concludes that even if an asymmetric force were to be discovered it could not lead to the production of a single form of an asymmetric compound.

> No fortuitous concourse of atoms, even with all eternity for them to clash and combine in, could compass this feat of the formation of the first optically active organic compound. . . . But the chance synthesis of the simplest optically active compound from inorganic materials is absolutely inconceivable. So also is the separation of two crystallized enantiomorphs under purely symmetric conditions. . . . I see no escape from the conclusion that, at the moment when life first arose, a directive force came into play—a force of precisely the same character as that which enables the intelligent operator, by the exercise of his Will, to select one crystallized enantiomorph and reject its asymmetric opposite.

Pearson dissents strongly from Japp's view that "the chance synthesis of the simplest optically active compound from inorganic materials is absolutely inconceivable." Japp had likened the result of the process whereby the dextro and levo forms of an asymmetric compound are produced from inorganic or symmetrical materials, to the tossing of a coin. If the coin is a perfectly balanced one the chances are equal as to whether it falls heads or tails; so in the synthesis of an asymmetric compound the chances are equal for the production of the two possible forms. Pearson argues, however, that if one will toss a coin (say) twenty times that while the results in general will be ten heads and ten tails, nevertheless there will be a variation from this mean; and that if the act of tossing were to be continued an infinite number of times one might come to an instance of twenty heads or twenty tails. So in the synthesis of the dextro and levo forms of an asymmetric compound, any action which gives rise to them, carried on through the ages, must produce the two forms in unequal amounts and the form in excess would then act as "breeders" in building up other asymmetric forms.

Fitzgerald argues that life probably originated from a few centers and possibly a single center. In the former case the chances are that either the dextro or the levo form predominated, so that asymmetry might have resulted, while in the latter case asymmetry must have resulted.

Herbert Spencer in criticizing the attitude of Japp states that he does so not "for the purpose of showing the adequacy of the physico-chemical interpretation of life, but for the purpose of showing the inadequacy of Professor Japp's argument against it." Spencer insists that, even granting that the dextro and levo forms of protein were formed originally in equal numbers these would not remain mixed together, but that their separation would follow in accordance with a universal law to the effect that unlike units, when acted upon by the same forces, are affected differently and that ultimately this difference will result in the segregation of the like units; in other words, the dextro and levo forms would in the course of time separate into the two groups of like molecules.

Others criticize Japp's statement to the effect that the right- and left-handed crystals can not be separated except through the agency of life. They think it quite possible for such a separation to have been brought about by ordinary natural agencies.

Thus Bartrum holds that it is entirely conceivable that the two forms of crystals on separation might be unevenly grouped, and that conditions might change so that partial solution would take place in which the one set of crystals might be more favorably situated than the other, and that the resulting solution would then be optically active.

Errara thinks that the facts can be explained upon the assumption that the two forms generated somewhere in space, were separated by being whirled around through space, and that one of these forms reached the earth. From this all other asymmetric compounds might have originated.

Kipping and Pope give the results of experiments which prove that a single set of crystals deposited from a solution of a racemic compound is not always composed of equal amounts of the two forms, in which case not only the crystals, but the mother liquor as well, are optically active. Conditions here which give rise to the optically active substances are such as might exist in a purely inorganic world.

Professor Japp in his arguments in favor of vitalism was at a disadvantage in that his position upon the question compelled him to assume the attitude of one who denies the possibility of future advancement. He not only had to contend that none of the methods proposed would lead to an asymmetric synthesis, but that no methods ever would be discovered that would lead to such a synthesis. This latter position is a rather hazardous one to assume in these days of scientific advancement, in which the impossibilities of the one decade become the realities of the next. Aside from this attitude, the vulnerable point in Japp's position is the statement "that the chance synthesis of the simplest optically active compound from inorganic materials is absolutely inconceivable." It was against this view that most of the criticism was launched. In the subsequent discussion Japp admitted, indirectly at least, that this statement was perhaps too strong, for he adds that "all my critics seem to be moving in that unreal world where a font of type if jumbled together sufficiently often ends by setting up the text of Hamlet"—to which Frankland replies that if the font of type were jumbled an infinite number of times, the text of Hamlet *must* result.

Stewart has also called attention to another possible explanation for the generation of optically active forms in nature. Cotton (1896) proved that the two forms of copper ammonium tartrate absorb dextro-circularly polarized light unequally—a difference which would tend to favor the generation of the one form over the other in the presence of such light. Byk (1904) has shown that light is circularly polarized by reflection from water of the sea. Stewart finds in the combined observations of Cotton and Byk a satisfactory explanation for the presence in nature of optically active forms.

It is evident from the mere fact that Professor Japp's contention aroused such a series of discussions, and that these discussions apparently only served to strengthen the attitude of each of the participants in his original belief, that the facts of asymmetric syntheses can not be regarded as giving evidence at all conclusive in favor of the doctrine of vitalism. On the other hand, it must be admitted that the opponents of the doctrine have advanced no conclusive arguments in opposition to it. For while it is possible to imagine conditions under which asymmetric groups might have arisen in a purely inorganic world, nevertheless, such an argument may have little weight. To carry conviction the conditions for producing such groups must not only be possible; they must also lie within the bounds of probability. Whether or not the conditions assumed by Japp's critics to account for the production of the first asymmetric groups from inorganic materials, are probable conditions, is a question upon which there would undoubtedly be a difference of opinion. I am sure, however, that all of us would agree that some

of the assumptions made are not very plausible.

At first thought, one might conclude that, with the problem of asymmetric syntheses as with the problem of life itself, the main difficulty is to account for the initial step. Given the unit living cell, all others might have developed from this; likewise given the unit asymmetric group, this might serve as the "seed" from which all the countless forms that exist in nature may have sprung. Granting, however, that the formation of the original asymmetric group or groups is satisfactorily explained, another perplexing question at once presents itself. For with perhaps a single exception, in all the partial asymmetric syntheses effected in the laboratory, both forms have been produced. In other words, the best we can do is to synthesize the one form in excess of the other and as a rule this excess is only slight. On the other hand, out of all the infinite variety of optically active compounds found in nature, only in very rare instances are both forms found. Ordinary lactic acid, produced by the fermentation of lactose, contains both forms, although in slightly unequal amounts: *dl*-limonene (dipentene) occurs in certain turpentine oils, while levo-asparagine is found in some plants along with small amounts of the dextro compound. In the laboratory, therefore, the production of both forms is the almost invariable rule; in nature it is the marked exception. To explain this difference upon the assumption that the methods of nature like those of the laboratory lead to the synthesis of both forms, one of which is destroyed as fast as generated, is, in the light of our present knowledge, quite as unsatisfactory as is the assumption that one form only is produced.

The assumption that there exists in the living organism a vital or guiding force which directs the changes that take place within the organism has never been a popular one among chemists. It is fortunate that this is so, for to accept such a belief would be to destroy the spirit of investigation, so far as it applies to a study of many of the problems connected with the living organism. However, the chemist, familiar with the wonderful results that may be accomplished through the action of chemical forces and recognizing that as yet we have but little insight into the nature of these forces, is apt to ascribe to them powers that can not be justified in the light of the knowledge at hand.

The discovery of Wöhler that urea can be synthesized in the laboratory was of the greatest importance; but neither the synthesis of urea nor the synthesis of any other of the almost countless number of compounds effected in the laboratory actually disproves the existence of a vital force in the living organism. Likewise it is certain, to my mind at least, that while the facts of asymmetric synthesis, so far as we can discern at the present time, do not prove the existence of such a force in the living organism, neither do they present any valid argument against the belief in its existence. So far as they have a bearing upon the question, life remains as it always has been—the great mystery.

WILLIAM MCPHERSON
OHIO STATE UNIVERSITY,
COLUMBUS, OHIO

SCIENTIFIC EVENTS

MINUTE ON THE LIFE AND SERVICES OF HUGO MÜNSTERBERG

THE following minute on the life and services of Professor Hugo Münsterberg was placed upon the records of the faculty of arts and sciences of Harvard University at the meeting of January 16, 1917:

Hugo Münsterberg, professor of psychology, died in Cambridge on the sixteenth of December, 1916. He was born in Danzig, West Prussia, June 1, 1863. After leaving the gymnasium in his native

city, he studied philosophy in Leipzig, under Wundt among others, taking the degree of Doctor of Philosophy in 1885, and went on with physiological studies in Heidelberg (M.D., in 1887).

In 1887 he habilitated at Freiburg, in Baden, and in 1891 was made professor extraordinary there. An acquaintance with William James, whom he met at a psychological congress in Paris in 1889, led to a call to a professorship of experimental psychology in this university, and he began teaching here in the fall of 1892. The academic years 1895–96 and 1896–97 were spent in Freiburg again, on leave of absence, and on his return to Cambridge in 1897 he was appointed professor of psychology. Professor Münsterberg received the honorary degree of A.M. from Harvard in 1901, LL.D., from Washington University, St. Louis, in 1904, and Litt.D., from Lafayette College in 1907. He was president of the American Psychological Association in 1898 and of the American Philosophical Association in 1908, and was a Fellow of the American Academy of Arts and Sciences and a member of the Washington Academy of Sciences. He had a leading part in forming and carrying out the plans for the International Congress of Arts and Sciences at the St. Louis Exposition in 1904 and in the subsequent publication of its proceedings. In 1901–11 he was the Harvard exchange professor at the University of Berlin.

Münsterberg's fertility and enormous industry were conspicuous from the beginning. While still at Freiburg he published four parts of a theoretical and experimental work entitled "Beiträge zur experimentellen Psychologie," and four volumes on psychological subjects.

His first years in Cambridge were mainly spent, beside the daily tasks of instruction, in developing the psychological laboratory and fostering research. To the students who resorted to him for training in the new methods of experimental psychology he gave freely of time and interest, and his fertile invention supplied many and varied problems for investigation. The production of the laboratory steadily increased in volume and significance, and in 1903 a medium of publication was established under Münsterberg's direction in the "Harvard Psychological Studies." The well planned and equipped laboratory in Emerson Hall, opened in 1905, was chiefly due to his efforts.

His first American book appeared in 1899, a collection of essays entitled "Psychology and Life." It was followed by more than twenty volumes, besides a prodigious number of articles in periodicals. Of his more strictly scientific writings during this period the most important are "Grundzüge der Psychologie" (1900)—the first volume of a largely planned work which was never completed—"Science and Idealism" (1906), "The Eternal Values" (1909), "Grundzüge der Psychotechnik" (1914). In the latter years of his life his interest turned more and more to the applications of psychology, the practical bearings of the science on education, law, medicine and industry. To this series belong, "Psychotherapy" (1909), "Psychology and the Teacher" (1910), "Psychology and Industrial Efficiency" (1913), with many occasional publications. Münsterberg had a deep interest also in educational, social and political problems, and wrote much upon them, from "American Traits" (1901) and "Die Amerikaner" (1904), translated (1905) "The Americans," to his recent books on "The War and America," "The Peace and America" and "To-morrow" (1916).

With this great productivity, he was a notable teacher not only of advanced students in the seminary or laboratory but of large classes of undergraduates whom from year to year he introduced to the elements of psychology.

A man of strong and self-confident opinions and positive expression, he was of a kindly spirit, hospitable, generous, appreciative of others. His mental energy seemed limitless, his industry tireless, his optimism unquenchable. He exemplified his own ideal of productive scholarship, and carried to the grave with him plans for more books than most of us would think of achieving in a lifetime.

MEMORIAL TO SUSANNA PHELPS GAGE

Professor Simon Henry Gage and his son Henry Phelps Gage, Ph.D. Cornell 1909, have given to Cornell University ten thousand dollars as a memorial to Susanna Phelps Gage, Ph.B. 1880, who was the first woman to take laboratory work in physics in that institution and who in her subsequent career as a neurologist showed the highest appreciation of the need for research in our country.

The fund thus established is to be known as the *Susanna Phelps Gage Fund for Research in Physics in Cornell University.*

It is the wish of the donors that the income be administered by the professors of physics with the cooperation of the president of the university; and that it be used in any way which at the time gives promise of advancing knowledge in physics. The

income could therefore be properly applied to a graduate fellowship or scholarship, the purchase of apparatus, of books and periodicals or for any other purpose which at the time and occasion give promise of advancing knowledge.[1]

The first installment of income becomes available at the beginning of the second half century of the university (1918–19).

On Wednesday evening, January 10, 1917, the members of the physics seminary and a few friends dined together at the University Club in Ithaca, on which occasion the establishment of the new research fund was celebrated. In expressing to the donors the appreciation of the department of physics Professor Nichols said:

The value of a gift like this, the income of which from year to year is placed freely at the disposal of those who are responsible for the promotion within the university of one of the fundamental sciences, to be expended in whatever manner from time to time may be most advantageous to the furtherance of research, is inestimable. It comes, moreover, at a time peculiarly opportune; when public opinion is aroused to some realization of the importance of research to human welfare. The history of science and industry teaches clearly that applied science upon which the material welfare of the race so greatly depends, advances only with the growth of pure science and that the university affords the most favorable, indeed, almost the exclusive, atmosphere in which research flourishes. Hence the demand, now beginning to be heard, not so much from within academic circles as from outside, that the universities of this country make the advancement of learning their prime function. Every such gift as this furthers that great end.

Modest though it be, in comparison with what men of great wealth may do for science without the least personal denial, this fund is especially welcome in that it comes from men of science and is given in a spirit of devotion to science and of real self sacrifice.

It is a notable and gratifying evidence of the unity of the scientific spirit that this fund for the promotion of physics is established in memory of one whose life was given to biology and who attained eminence by her contributions to that sister science; and that one of the donors who is with us to-night, and whom we delight to honor, is himself a biologist of renown.

[1] Quotation from the deed of gift.

On behalf of my present colleagues of the department of physics I accept this gift. We shall endeavor to expend the income from it in the spirit in which it is given and in loving recognition of the generosity and devotion of the donors. In generations to come, we may rest assured, the noble intent of the donors will ever influence those intrusted with its administration and that thus it will ever be used for the true advancement of science.

THE AMERICAN INSTITUTE OF MINING ENGINEERS

THE program of the one hundred and fourteenth meeting of the American Institute of Mining Engineers, which convenes in New York City on February 19, has been issued. Sessions will include the annual business meeting and presentation of papers on subjects of scientific interest in the mining field. In addition, a number of special social features are being planned, including an all-day excursion by special train to West Point, where the engineers will view a number of exhibitions and inspect the grounds of the Military Academy. According to registrations received, this year's prosperity of the mining camps in the middle and far west will be reflected in the attendance at the February meeting. Individuals connected with practically all of these will take some part in the technical sessions.

The meeting will extend over four days, and will open on February 19, with sessions on geology, metallography, petroleum and gas, and milling and smelting. On the following day, sessions will be held on iron blast furnace practise on flotation. The principal sessions of the third day will be held on the manufacture of iron and steel.

Among the papers which will be presented are:

"Recent Geologic Developments on the Mesabi Iron Range, Minn.," by J. F. Wolff.

"Grain Growth Phenomena in Metals," by Henry M. Howe and Ray Jeffries.

"Evidence of the Oklahoma Oil Fields on the Anticlinal Theory," by Dorsey Hager.

"Magnetic Concentration of Low-Grade Magnetic Iron Ore," by S. Norton.

"The Conservation of Phosphate Rock in the United States," by W. C. Phalen.

"Potash as a By-product from the Blast Furnace," by R. J. Wysor.

"Significance of Manganese in American Steel Metallurgy," by F. H. Willcox.

The committee on arrangements for the convention includes: David H. Browne, chairman; Lawrence Addicks, P. E. Barbour, George D. Barron, Karl Eilers, Louis D. Huntoon, H. A. Megraw, Thomas T. Read, Burr A. Robinson, F. T. Rubidge, E. Maltby Shipp, Bradley Stoughton, Edward B. Sturgis and Arthur L. Walker.

APPROPRIATIONS FOR THE DEPARTMENT OF AGRICULTURE

The House Bill making appropriations to the U. S. Department of Agriculture for the fiscal year ending June 30, 1918, is now under discussion. The main bill carries a total appropriation for routine and ordinary work of $24,221,081. To this great amount are added other sums bringing the total amount carried in the bill to $25,694,685. The amounts appropriated to the scientific bureaus are as follows:

Weather Bureau	$1,778,320
Bureau of Animal Industry	3,528,286
Bureau of Plant Industry	2,769,630
Forest Service	5,711,195
Bureau of Chemistry	1,212,311
Bureau of Soils	363,855
Bureau of Entomology	911,980
Bureau of Biological Survey	589,510
Office of Public Roads and Rural Engineering	702,100

SCIENTIFIC NOTES AND NEWS

Sir William Crookes, the distinguished English chemist; Dr. C. A. Angot, director of the French Bureau of Meteorology, and Professor August Gärtner, professor of hygiene, University of Jena, have been elected foreign members of the Academy of Sciences of Sweden.

The Elisha Kent Kane medal of the Geographical Society of Philadelphia was, on January 19, conferred on Dr. William Curtis Farabee. Dr. Farabee gave before the society an illustrated lecture on "Exploration in the Amazon Valley and in the Unknown Guinea, 1913 to 1916." Dr. Farabee has also had conferred upon him the gold medal of the Explorers' Club of New York.

Professor E. F. Northrup, research physicist of Princeton University, has been awarded the Elliott Cresson medal by the Franklin Institute "in recognition of his electrical inventions and high temperature investigations."

Professor Wilbur M. Wilson, of the department of civil engineering at the University of Illinois, was honored by the Western Society of Engineers at its annual meeting on January 10, by having conferred upon him the Octave Chanute medal, in recognition of the fact that a paper presented by him in 1915 was judged to be the best in the field of civil engineering presented before the society during that year. The medal was established in memory of Dr. Octave Chanute, whose studies in the field of aerodynamics were notable.

Brigadier General Joseph E. Kuhn has been appointed president of the War College.

E. D. Ball, formerly director of the Utah Station, has been made state entomologist of Wisconsin, vice J. G. Saunders resigned to succeed H. A. Surface as economic zoologist of Pennsylvania.

Professor Werner has been appointed director of the Heidelberg Institute for the Investigation of Cancer established by the late Professor Czerny.

After twenty years' service in the New York Department of Health, Dr. John S. Billings, now deputy commissioner of health and director of the bureau of preventable diseases, has offered his resignation, to take effect on May 1.

Earl B. Smith, formerly with the U. S. Office of Public Roads and Rural Engineering has been transferred to the U. S. Bureau of Soils as mechanical engineer. His work will be on engineering lines in the design and construction of the new government potash plant at Summerland, California, where he, with Dr. Turrentine, of the Department of Agriculture, will investigate the commercial possibilities of extracting potash, iodine, tar

products, acetone, etc., from the kelps of the Pacific coast.

DR. L. H. BAILEY, Mrs. Bailey and Miss Bailey are preparing to leave Ithaca at the end of this month for a tour of the Far East to last the greater part of a year.

ROALD AMUNDSEN has definitely postponed the execution of his plans for an expedition to the north pole until after the war. His ship was almost equipped for the trip, which was to have lasted three or four years, and the crew had been hired; but the money difficulties proved insuperable. The necessary expenses of the expedition in consequence of war prices have mounted from $135,000 to double that figure.

THE annual meeting of the Brooklyn Entomological Society was held on January 13 and the following officers were elected for 1917: President, W. T. Bather; Vice-president, W. T. Davis; Treasurer, C. E. Olsen; Recording Secretary, J. R. de la Torre Bueno; Corresponding Secretary, R. P. Dow; Librarian, A. C. Weeks; Publication Committee, J. R. de la Torre Bueno, C. Schaeffer and R. P. Dow.

DR. JAMES R. ANGELL, of the University of Chicago, is giving a course of lectures on "The Makers of Modern Psychology" on the Spencer Foundation at Union College.

A COURSE of twenty-four lectures on ore deposits is being delivered before the department of geology of Columbia University by Professor John D. Irving, professor of economic geology, Sheffield Scientific School, Yale University.

PROFESSOR F. J. METZGER, of the department of chemical engineering, Columbia University, has resigned his position to accept the position of manager of chemical development, with the Air Reduction Company, New York.

UNIVERSITY AND EDUCATIONAL NEWS

THE late Dr. John A. McCorkle had set aside in trust bonds of the market value of $50,000 which became payable to the Long Island College Hospital upon his death. A committee of prominent citizens, headed by the Honorable Edgar M. Cullen, is endeavoring to raise an equal amount as a memorial fund to Dr. McCorkle.

A GIFT of $50,000 to the principal of the alumni fund, subject to an annuity, from a graduate of the class of 1867, Yale College, was announced at the last meeting of the corporation. This is the second gift of like amount and under similar conditions that has been made to the credit of the class of 1867 in the alumni fund. There has also been received, from Robert W. Kelley, '74, class agent and a director of the fund, $125,000 (subject to an annuity as to four fifths of the amount), the whole to be added to the Yale Alumni Fund as an addition to the permanent memorial fund of 1874.

DR. WILLIAM WISTAR COMFORT, professor of the Romance languages and literatures and head of the department at Cornell University, has been elected president of Haverford College. He will succeed Dr. Isaac Sharpless, who will retire after completing a service of thirty years in the Haverford presidency.

J. O. RANKIN has resigned as agricultural editor at the Missouri Station to become associate professor of agricultural economics at the Iowa College, and is succeeded by M. N. Beeler, agricultural editor at the University of Florida.

DR. RAOUL BLANCHARD, professor of geography and director of the Institute of Geography at the University of Grenoble, has been appointed exchange professor at Harvard for 1916–17. His term of service will fall in the second half year.

DR. V. A. COULTER, Ph.D., has been appointed assistant professor of chemistry in the University of North Carolina.

DISCUSSION AND CORRESPONDENCE

NEGATIVE SURFACE TENSION

IN a recent number of SCIENCE (November 24, 1916) Professor W. A. Patrick in a note on "Ostwald's Handbook of Colloidal Chemistry," expresses doubt as to the existence of negative surface tension, and suggests that it

can scarcely be conceived without assuming a force of repulsion instead of attraction between molecules of the liquid.

But he surely can not mean to question the existence of negative surface tension at a surface *between a liquid and solid,* for how otherwise are we to explain the most familiar facts in capillarity. Is it not negative surface tension which causes the water to rise in a capillary tube, or against a glass wall, and causes a drop of oil to expand indefinitely over a glass plate? Is it not the greater negative surface tension in the oil-glass surface which causes the film to expand against the contractile force, or positive surface tension of the oil-air surface?

Nor does it appear to be necessary to suppose a repulsive force between molecules of the liquid in order to account for the existence of such a negative tension, for if the resultant force of attraction on a particle of liquid near the surface, due to all particles on both sides of the surface lying within the range of sensible molecular attraction, is directed away from the surface and towards the interior of the liquid, the particle will tend toward the interior and we shall have positive surface tension but if the resultant attraction is toward the surface there will be negative surface tension.

In case of an air-liquid surface the attraction of neighboring liquid particles upon a particle in the surface is so much greater than any opposing outward attraction by adjoining air molecules that the first condition holds and the surface tension is positive. While at a glass-oil surface a particle of liquid near the surface may be supposed to be more strongly attracted by the neighboring glass molecules than by the oil molecules in its vicinity, in which case the resultant attraction is toward the glass, the potential energy of a liquid particle is less at the surface than in the interior of the liquid, and the surface tension is negative.

When liquid comes against liquid the case is complicated by the mobility of particles on both sides of the boundary. It seems probable, however, taking an oil-water surface as an example, that if the resultant attraction on an oil molecule at the surface is directed across the boundary from the oil side toward the water, that a water molecule at the surface being in the same situation with respect to the surrounding molecules will be urged in the same direction. In other words, we can hardly imagine a particle of one sort in the surface as being drawn in one direction by the attraction of all the surrounding particles on both sides of the surface, while a similarly situated particle of the other sort would be drawn in the opposite direction.

We may assume then that at a surface between two liquids, particles on one side are urged away from the surface, while those on the other side are urged toward it. That is, there are two influences, one tending to contract the surface and the other to expand it. If the first is predominant there is positive surface tension, this is the ordinary case where diffusion does not take place, as with water-oil or water-mercury.

If the second is predominant the surface tends to expand indefinitely, and the limit would seem to be reached only when one liquid is uniformly diffused throughout the other. In this case diffusion is to be expected also from the consideration that if particles in the one liquid are drawn so powerfully towards the other as to force the expansion of the second liquid in opposition to its contractile tendency, it seems probable that they will be drawn actually *into* the second liquid and thus the integrity of the surface be destroyed. We conclude, therefore, that *a positive surface tension is to be expected between all liquids that do not interdiffuse.*

If the particles in a colloid solution are to be regarded as solid, we may expect to find cases where the surface tension is positive and other cases where it is negative. Where it is positive there will be a tendency to flocculate, for as two colloid particles come together liquid particles move out from between them into the interior of the liquid, and the capillary region surrounding the particles is thus decreased in volume, and the potential energy of the system is diminished. When, on the other

hand, the surface tension is negative at the surface of a colloid particle, there will be no flocculation, and the particles will not approach each other near enough to crowd the liquid out of the region of surface energy around either particle. This, of course, does not imply that there is any tendency in the latter case for the colloid particles to remain in equilibrium equally diffused throughout the liquid.

ARTHUR L. KIMBALL
AMHERST COLLEGE

THE WHITE PINE BLISTER RUST; DOES THE FUNGUS WINTER ON THE CURRANT?

IN the work carried out in the Province of Ontario during the last two years on this disease, strong suspicions have been aroused that the fungus may in some cases pass the winter on the currants themselves. Several lines of evidence support these suspicions.

1. The commencement of the currant stage each spring here and there over large areas, without any apparent relation to the pines therein.

2. The similar yearly recurrence of the currant rust in one particular district ten miles by four miles in extent. In this area (*a*) the rust outbreaks do not bear any apparent relation to the pines; (*b*) the pines are very few in number; (*c*) many lots of these pines are small and their freedom from disease has been established; (*d*) the evidence from five lots of these young pines growing close to infected currants indicates that the rust was not introduced into this area until 1914, and that therefore the prevalent currant stage of 1915 and 1916 could not be due to pine blisters, which have not yet had time to mature.

3. The finding of six cases of the currant stage early in the year from one to two miles distant from any possible source of pine infection.

4. The occurrence of currant rust in 1916 on two adjacent plants in a large plantation. Early in the year these two only were rusted. The only four plants which were badly diseased here in 1915 included these two.

5. The occurrence of a rust outbreak on a plot of one hundred black currant plants which were badly rusted in 1914, and which had been set out in a disease-free neighborhood in the spring of 1915 to test hibernation.

A hypothesis is advanced which gives a reasonable explanation of the suspected hibernation. The rust often causes early defoliation of the currant plants, and this defoliation is followed by a secondary production of foliage, due to the development of winter buds. The general occurrence of the rust on these secondary leaves suggests that, allowing for the two weeks' incubation period, the infection must take place very early in their growth, and the question naturally follows: can such started buds be infected at such an early stage in their development that if winter conditions set in soon after, the buds are still capable of surviving?

W. A. MCCUBBIN
DIVISION OF BOTANY,
EXPERIMENTAL FARM SYSTEM,
DOMINION OF CANADA,
November, 1916

PAMPHLET COLLECTIONS

TO THE EDITOR OF SCIENCE: I note in SCIENCE for November 24, an article by Tracy I. Storer from the University of California on "The Care of Pamphlet Collections" in which a type of cardboard case open at the back only and "not larger than $12 \times 8 \times 2\frac{1}{2}$ inches" is recommended for this purpose. Permit me to state that such cases differing only in size—mine are $11 \times 7 \times 3$ inches—have been in use in my department since 1904. Several other departments in the university had such cases made after my design and they have been in rather general use here since. I do not remember whether the idea is original with me or not. These cases are arranged alphabetically by authors and the card index is by subject with the catch word first on the card.

CHAS. B. MORREY
DEPARTMENT OF BACTERIOLOGY,
OHIO STATE UNIVERSITY

INDUSTRIAL LABORATORIES AND SCIENTIFIC INFORMATION

TO THE EDITOR OF SCIENCE: The undersigned committee on engineering of the General Committee on Research, of the American Associa-

tion for the Advancement of Science, feel that it is timely to issue the following appeal to the industrial research laboratories of the country.

In the course of work done in the numerous industrial laboratories of America, many physical and commercial constants and data of great scientific interest and value are doubtless arrived at, which may, for a certain period of time, constitute an asset of considerable commercial value to the particular corporations in question. During this period, every one recognizes the proprietary right of the industrial laboratories to the retention of this information.

A time frequently arrives, however, when such scientific information loses its commercial value (often by being duplicated in other laboratories), and just at this point we wish to impress upon the industries their obligation to enrich scientific literature with such facts and data, which might otherwise be lost or forgotten.

Some of our industries have been reproached with the suspicion of acting as sponges, in that they absorb an immense amount of useful information from scientific literature without giving any return in kind. This suspicion would be entirely removed if, from time to time, scientific information which has ceased to be of commercial value were contributed by them to its appropriate channel and thus became available to all scientific workers throughout the world.

If any doubt exists as to the appropriate channel for the publication of such scientific data and communications, the general secretary of the American Association for the Advancement of Science, Dr. J. McKeen Cattell, Garrison-on-Hudson, New York, will be glad to act as intermediary and to forward such communications to the proper scientific body.

A. E. Kennelly,
J. W. Richards,
A. Sauveur,
A. N. Talbot,
C. C. Thomas

Cambridge, Mass.,
January 18, 1917

SCIENTIFIC BOOKS

Lectures on Ten British Mathematicians of the Nineteenth Century. By Alexander Macfarlane. No. 17 of the Mathematical Monographs, edited by Mansfield Merriman and Robert S. Woodward. John Wiley and Sons, New York, 1916.

This posthumous publication contains most interesting biographies of ten of the leading mathematicians of the nineteenth century in Great Britain, namely, of George Peacock, Augustus De Morgan, Sir William Rowan Hamilton, George Boole, Arthur Cayley, William Kingdon Clifford, Henry John Stephen Smith, James Joseph Sylvester, Thomas Penyngton Kirkman, Isaac Todhunter.

These sketches are a part of the lectures given by Dr. Macfarlane at Lehigh University during the years 1901–04. "In a future volume it is hoped to issue lectures on ten mathematicians whose main work was in physics and astronomy." The author's personal acquaintance with some of these men, and with intimate friends of them, enabled him to add personal touches which will be relished by the reader. Particularly gratifying are the details about Boole and Kirkman, concerning whom little had previously appeared in print. The future historian of mathematics during the nineteenth century will find the booklet full of interesting material. The lecturer's aim was evidently to set forth the personalities whose scientific achievements were already known to the listener. Hence the scientific researches of these men are not described, but merely mentioned.

Illuminating information is given in several of the biographies relating to Great Britain as "an examination-ridden country," and relating to the effects of the theological tests formerly demanded of candidates for degrees and competitors for certain prizes. The opinions on the teaching of mathematics held by some of the English mathematicians are valuable at the present time when in the United States the mind-training-value of mathematical study is called into question.

The booklet is manufactured in attractive

form. Carelessness in the proof-reading is noticeable. Frequently letters are dropped out of words, their unceremonious departure being accentuated by the blank spaces left behind. The description of Newton's fluxional notation on page 9 is rendered unintelligible to one not already familiar with it by the omission in several instances of the necessary dots. The spelling on page 35 of Clairaut as "Clairault" is unusual, to say the least. The statement, page 120, that it was in 1872 that a deputy professor was appointed at Oxford to carry on the work relinquished by Sylvester is evidently wrong, since Sylvester was appointed to the Oxford position in 1883. It is too bad that the editors of this book allowed the repetition of the erroneous statement that the name of Sylvester's father was Abraham Joseph Sylvester. As recently stated by several writers, the name "Sylvester" did not belong to the father, but was assumed by an elder brother of the mathematician who had come to the United States, and later by the mathematician himself. The father's name was Abraham Joseph. The editors might also have corrected a mistake thus far almost universal, to the effect that Peaucellier was the first to devise an instrument for drawing a perfect straight line. It is a matter of great historical interest that a Frenchman by the name of Sarrut achieved this several years before Peaucellier, and in a manner quite different. An account of it will be found in the *Comptes Rendus,* Vol. 36, 1853, page 1036. Attention to Sarrut was called in 1905 by G. T. Bennett of Emmanuel College, Cambridge, in an article published in the *Philosophical Transactions,* 6th S., Vol. 9, page 803. Bennett gives interesting historical details, and also noteworthy developments of his own.

FLORIAN CAJORI

COLORADO COLLEGE,
COLORADO SPRINGS, COLO.

The Whalebone Whales of New England. By GLOVER M. ALLEN. Memoirs of the Boston Society of Natural History, Vol. 8, No. 2, pp. 107–322, pls. 8–15, text-figs. 1–12. September, 1916.

Dr. Glover M. Allen's "The Whalebone Whales of New England" treats of the three genera and six species of baleen whales "inhabiting the waters off the New England coast," with special reference to their habits, manner of occurrence, economic importance and technical history. Two "keys" are given for their identification, one for stranded specimens that can be approached and examined, the other for identification in life, based on their characteristic actions, the presence or absence of a fin on the back, and the size and form of the spout.

Following a few introductory pages of comment on the classification of whales in general and of the New England species in particular, the author deals at length with each of the living species, with a brief account of the single fossil species, long known from a few vertebræ and other fragmentary remains found at Gay Head, Marthas Vineyard. The North Atlantic right whale (*Eubalæna glacialis*) is of special interest historically on account of its having been the basis of the early New England whale fishery. This phase of the subject is presented in considerable detail (pp. 131–172), with many quaint extracts from early colonial records.

The species treated are: (1) North Atlantic right whale (*Eubalæna glacialis*), (2) common finback (*Balænoptera physalus*), (3) pollack whale (*B. borealis*), (4) blue whale (*B. musculus*), (5) little piked whale (*B. acuto-rostratus*), (6) Atlantic humpback (*Megaptera nodosa*). A methodical and concise account of each is given under appropriate subheadings, beginning with "history and nomenclature," followed by descriptions of their external and osteological characters, habits and food, seasons of occurrence, pursuit and economic products, enemies and parasites. Five of the species are illustrated by full-page plates of the external form, drawn to scale from careful measurements. Outline drawings of skulls are given in another plate, several photographic views of whales in another, and vertebræ and other fossil remains from the Miocene deposits of Gay Head in another. The monograph thus forms a valuable addi-

tion to the literature of the subject, constituting, as it does, the first attempt to treat comprehensively this important part of the marine mammal fauna of New England, and is a highly satisfactory summation of present knowledge of the subject. A bibliography of six pages (about 100 titles) gives references to the technical literature cited in the text, in addition to which are numerous footnote and other references in the text to historical records relating to the distribution and occurrence of the species in New England waters, from early colonial times to the present.

J. A. Allen
American Museum of Natural History

PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES

The eleventh number of Volume 2 of the *Proceedings of the National Academy of Sciences* contains the following articles:

Path Differences within which Spectrum Interferences are Observable: Carl Barus, Department of Physics, Brown University. The method of observing interferences in the zeroth, first, second, third, and even fourth order, successively, without essential change of the parts of the apparatus is noteworthy. The present experiments furnish a striking example of the uniform breadth of the strip of spectrum carrying the fringes, quite apart from the dispersion of the spectrum.

Non-Reversed Spectra of Restricted Coincidence: Carl Barus, Department of Physics, Brown University. The method, apart from any practical outcome, is worth pursuing because of the data it will furnish of the width of the strip of spectrum carrying interference fringes under any given conditions.

The Equilibrium between Acids and Bases in Sea Water: Lawrence J. Henderson and Edwin J. Cohn, Wolcott Gibbs Memorial Laboratory, Harvard University. The ocean, which, because of the presence of free carbonic acid, was originally acid, and which has been becoming more alkaline from the accumulation of basic material, is at present in an epoch where the growing alkalinity is checked by the *buffer* action of acids of approximately the strength of boric acid. These buffers regulate the reaction of sea water in a manner similar to the way in which bicarbonates and phosphates regulate the reaction of blood.

An Apparent Correspondence between the Chemistry of Igneous Magmas and of Organic Metabolism: Henry S. Washington, Geophysical Laboratory, Carnegie Institution of Washington. The object is to call attention to what appears to be a congruous relation of two pairs of elements in the organic world; it would appear that iron and sodium are necessary for animal metabolism, while magnesium and potassium are essential to vegetable metabolism.

The Oaks of America: William Trelease, Department of Botany, University of Illinois. A summary of a manuscript now prepared for submission to the academy for publication as one of its scientific memoirs. 354 species of oaks, of which about one half are new, are recognized. The relations to fossil oaks are pointed out.

A Set of Independent Postulates for Cyclic Order: Edward V. Huntington, Department of Mathematics, Harvard University. Five postulates are given for cyclic order.

A New Method of Studying Ideational and Allied Forms of Behavior in Man and Other Animals: Robert M. Yerkes, Psychological Laboratory, Harvard University. A description of the author's method of multiple choices for the deduction of reactive tendencies and the study of their rôle in the attempted solution of certain types of problem. The method involves the presentation to the subject of a problem or series of problems whose rapid and complete solution depends upon ideational processes.

Electrical Conduction in Dilute Amalgams: Gilbert N. Lewis and Thomas B. Hine, Department of Chemistry, University of California. The resistance of amalgams of lithium, sodium and potassium is studied at constant pressure and shows extraordinary differences; the resistances at constant average atomic volume are also calculated and found to differ materially from those at constant pressure.

Ideational Behavior of Monkeys and Apes: Robert M. Yerkes, Psychological Laboratory, Harvard University. The general conclusions which may be deduced are that the ape exhibits various forms of ideational behavior, whereas the reactive tendencies of monkeys are inferior in type.

The Osmotic Pressure and Lowering of the Freezing-Point of Mixtures of Salts with one another and with Non-Electrolytes in Aqueous Solutions: William D. Harkins, R. E. Hall and W. A. Roberts, Kent Chemical Laboratory, University of Chicago. The general result obtained with mixtures already investigated is that the lowering of the freezing-point of the mixture is very nearly that which would be calculated on the basis that each salt produces a lowering of the freezing-point proportional to its own concentration and to the mol-number which it has when present alone in a solution of salt concentration.

Certain General Properties of Functions: Henry Blumberg, Department of Mathematics, University of Nebraska.

Sphenacodon Marsh, A Permocarboniferous Theromorph Reptile from New Mexico: Samuel W. Williston, Walker Museum, University of Chicago. Reconstruction of a fossil reptile found in a bone bed from which some collections were made as early as thirty-eight years ago, but which seems to have been almost forgotten until recently.

On Volume in Biology: Lawrence J. Henderson, Chemical Laboratory of Harvard College. When equilibrium has been established in a heterogeneous system (capillary and gravitational phenomena being absent) the volume of the phases is not relevant to the state of the system, but in nearly all physiological changes the regulation of volume is of great importance.

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NOTES ON METEOROLOGY AND CLIMATOLOGY

TWO POPULAR WEATHER BOOKS

THE scientific book on meteorology, with its numerous tables, plates and figures is too expensive and too bulky, not to mention too technical for light reading. There are three standard American meteorological treatises. Professor W. M. Davis's "Elementary Meteorology"[1] is finely written and illustrated, but on account of advances in meteorology in the past twenty years it needs to be supplemented by Professor W. I. Milham's "Meteorology"[2] or by Dr. W. L. Moore's "Descriptive Meteorology."[3] There is ample room for the small, easily read books on instruments,[4] weather processes, and forecasting. Two such books deserve particular mention: "Our Own Weather," by Edwin C. Martin,[5] and "Reading the Weather," by T. Morris Longstreth.[6] The first is a carefully written, lucid account of weather processes. After a discussion of the general character and circulation of the atmosphere, the author takes as his main theme the cyclones and anticyclones of the United States and their secondary phenomena. At the end is a chapter on weather signs and superstitions. Rarely, there are weak spots. The cause of the deflection of the wind by the rotation of the earth is not "that a body of air travelling from the equator toward the poles carries with it an eastward speed acquired at the equator and exceeding always that which it finds in the parts to which it goes" (p. 23). When any body on the earth's surface is set in motion it is deflected by the disturbance of the equilibrium between gravity and the centrifugal tendency.[7] Elsewhere (p. 33) the author says that the stop in temperature fall with increase in altitude, and the reduction in wind velocity "above the seven-

[1] Boston, 1894, 4to, 355 pp., 106 figs., 6 charts.

[2] New York, 1912, 4to, 549 pp., 157 illustrations, 50 charts.

[3] New York, 1910, 4to, 344 pp., 81 figs., 45 charts.

[4] *Cf.* "Weather and Weather Instruments." Taylor Instrument Companies, Rochester, 1908, 8vo, 175 pp.

[5] New York, 1913, 8vo, 281 pp., 8 cloud plates, 8 maps.

[6] Outing Series 43, 1915, 12mo, 8 cloud plates.

[7] See Wm. Ferrel, "A Popular Treatise on the Winds," New York, 1889, pp. 42–88; or Davis, *op. cit.*, pp. 101 et seq.

mile level are thought to be due to as sudden a change in the constitution of the air itself, to especially a large loss in nitrogen and oxygen and an accession of hydrogen." So far as is known there is no sudden change in the air composition at this or any other level.[8] On the other hand, the author is to be credited with keeping constantly before the reader such important points as that warm air does not rise of itself, but, as he states concerning thunderstorm formation (p. 242):

> It is mainly under the atmospheric movements set up by cyclones that the bodies of cold air descend and begin to root out the bodies of hot air with the abruptness that makes thunderstorms.

Also, the precipitation of atmospheric moisture by cooling due to internal expansion of rising air is well emphasized. On both these points, Mr. Longstreth gives false impressions.

"Reading the Weather," is for those who want to know simply how to forecast the weather either with or without instruments. It is a lively account of keen personal observations of weather signs, set in a brief and mainly accurate explanation of weather processes. The central theme is "sky signs for campers." These the author expounds under the heads clouds, temperatures, rain and snow, dew and frost, thunderstorm, tornado, hurricane, cloudburst and halo. For the particular benefit of the commuter, a chapter on forecasting with a barometer follows. At the end of the book is a good account of the seasons, the Weather Bureau, and weather proverbs. Finally, a summary of all the prognostics previously described adds greatly to the value of the book for reference. On account of limited scope some of the physical explanations are made too brief for accuracy. Thus the definitions of anticyclone and cyclone are hardly scientific:

> The anticyclone (cyclone) is an accumulation of air that has become colder (warmer) than the air surrounding it (pp. 20 and 44).

The author, himself, shows the limitations of these definitions when speaking of summer temperatures:

> The clear skies of the preceding anticyclone had permitted the land to warm up very fast under the midsummer sun, and the clouds of the cyclone, by cutting off the supply, had made a relative chill (p. 89).

Although the book was written largely on the northeastern United States, its value is not by any means limited to this section of the country.

[8] See table and diagram pp. 46–47 in A. Wegener: "Thermodynamik der Atmosphäre," Leipzig, 1911. The results of analyses of air samples taken at 9 km. altitude, 1910 to 1912, as compared with the earth's surface, indicate a reduction of about 6 per cent. in the volume of carbon dioxide, and an increase of perhaps 50 per cent. in the lightest gases: see *Scientific American Supp.*, December 23, 1916, p. 414.

DR. JULIUS VON HANN[9]

With the passing of 1915, fifty years have elapsed during which Julius von Hann has edited the *Meteorologische Zeitschrift*. Dr. Hann edited the *Zeitschrift der Oesterreichischen Gesellschaft für Meteorologie* with C. Jelinek from its establishment in 1866 until 1876; and, after his death, alone to the year 1885. On merging it with the German Meteorological Society's *Meteorologischen Zeitschrift* under the title of the latter, he pursued the editorship in common with Köppen from 1886 to 1891, with Hellman, 1892 to 1907 and since then with Süring.

This 50-year editorial jubilee in connection with a scientific magazine is unique. Furthermore, never has there been an editor who even made so many contributions to his scientific magazine as he. No fewer than 134 extensive articles, 1123 smaller contributions, 166 reviews and numerous unsigned articles, have come from him. In addition he has written many monographs, and he has published what are now the most exhaustive and authoritative treatises on climatology and meteorology.[10]

Charles F. Brooks
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[9] Taken mostly from the frontispiece by Hellmann, Köppen, and Süring, *Meteorologische Zeitschrift*, January, 1916, Vol. 33.

[10] Hann's "Handbuch der Klimatologie," third ed., 1908–1911, 3 vols., 8vo, 1,533 pp., 41 figs. "Lehrbuch der Meteorologie," third ed., 1914–1915, with Dr. Süring in collaboration, 4to, 847 pp., 28 pl., 4 tables, 108 illustrations.

SPECIAL ARTICLES

THE ROOT-ROT DISEASE OF THE APPLE IN VIRGINIA

AN unusually destructive rotting of the roots of apple trees is prevalent in the chief orchard sections of Virginia. The infectiousness of this condition is shown in the death of adjoining trees in groups of considerable numbers irrespective of soil conditions or topography and the death of replants set in holes from which rotted trees were removed.

The symptoms of this disease have been known for some time, but the causative organism has not been determined.

Isolations from diseased roots by the writers from a number of orchards in the "Valley" and "Piedmont" sections of the state have yielded cultures of an imperfect fungus which appears to be the conidial stage of a species of *Xylaria*. Inoculations made from pure culture of these isolations into bark wounds of living apple roots in both damp chambers and in the field have produced typical rotting of the bark and wood, and the introduced fungus has been obtained in pure culture from the margins of these infected portions.

Recently perithecial stromata of *Xylaria polymorpha* (Pers.) Grev. have been found on roots of apple trees in various stages of typical root-rot attack and on the stumps of several deciduous trees in a small patch of woodland immediately adjoining the orchard in question. Cultures obtained from germinated ascospores of this fungus are being used for additional inoculations into apple roots.

Pending the results of these inoculations, it seems reasonably certain that a species of *Xylaria* is responsible for the root-rot disease of the apple in Virginia. It is possible that more than one species of *Xylaria* is involved, since certain constant cultural distinctions exist between some of the isolations; these, however, may be varietal rather than specific.

Apparently all varieties of the apple are susceptible and probably equally so. Observations indicate that the disease may be spread in cultivation or in the removal of borers, in contact between roots systems of diseased and healthy trees, and by surface washing of spores or other infective material.

F. D. FROMME,
H. E. THOMAS
VIRGINIA POLYTECHNIC INSTITUTE

THE AMERICAN MATHEMATICAL SOCIETY

THE twenty-third annual meeting of the American Mathematical Society, which was held at Columbia University on Wednesday and Thursday, December 27–28, 1916, was in several respects an exceptional occasion. It took place in the midst of the convocation week series of meetings of the American Association for the Advancement of Science and its long train of affiliated societies, and was immediately followed by the second annual meeting of the newly organized Mathematical Association of America, with which the society has not only a large common membership, but also a general community of interest highly beneficial to both. The annual meeting is always one of the largest of the year, being the season of the election of officers and other members of the council and the transaction of important business. This year it was especially marked by the delivery of the retiring address of President E. W. Brown, of Yale University, who chose as his subject "The relations of mathematics to the natural sciences." This was presented before a joint session of the American Mathematical Society, the Mathematical Association of America, the American Astronomical Society, and Section A of the American Association, and was followed by the retiring address of Vice-president A. O. Leuschner, of Section A, on "Derivation of orbits—theory and practise." A joint dinner of four organizations was held on Thursday evening at the Park Avenue Hotel, with an attendance of 143 members and friends. Much of the credit for the great success of the meetings is due to the joint committee on arrangements and to the program committees of the Mathematical Association.

Under all these favorable circumstances the attendance at the four sessions of the society exceeded all previous records, the number of members present being 131. President Brown occupied the chair, being relieved by Vice-presidents Hedrick and Snyder and Professor G. D. Olds. The council announced the election of the following persons to membership in the society: Professor H. H. Conwell, University of Idaho; Mr. Robert

Dysart, Boston, Mass.; Dr. Mary G. Haseman, Johns Hopkins University; Mr. J. B. Scarborough, North Carolina Agricultural and Mechanical College; Mr. J. J. Tanzola, U. S. Naval Academy. Ten applications for membership in the society were received.

In response to an invitation received from the department of mathematics of the University of Chicago, it was decided to hold the summer meeting and colloquium of the society at that university in 1919. Committees were appointed to arrange for the summer meeting of 1917 and to publish the Cambridge Colloquium Lectures, which will probably appear in the early summer.

The total membership of the society is now 732, including 75 life members; the annual published list will be issued in January. The total attendance of members at all meetings, including sectional meetings, during the past year was 490; the number of papers read was 205. The number of members attending at least one meeting during the year was 278. At the annual meeting 235 votes were cast. The treasurer's report shows a balance of $10,198.38, including the life membership fund of $6,039.87. Sales of the society's publications during the year amounted to $1,434.28. The library now contains about 5,377 volumes, excluding unbound dissertations.

At the annual election, which closed on Thursday morning, the following officers and other members of the council were chosen:

President: L. E. Dickson.

Vice-presidents: A. B. Coble, E. B. Wilson.

Secretary: F. N. Cole.

Treasurer: J. H. Tanner.

Librarian: D. E. Smith.

Committee of Publication: F. N. Cole, Virgil Snyder, J. W. Young.

Members of the Council to serve until December 1919: G. C. Evans, L. A. Howland, G. H. Ling, R. L. Moore.

The following papers were read at this meeting:

J. E. Rowe: "The relation of singularities of the rational quintic in space to loci of the rational plane quintic."

C. A. Fischer: "Linear functionals of n-spreads."

H. B. Mitchell: "Geometrical limits for the imaginary roots of a polynomial with real coefficients."

Arnold Emch: "A theorem on the curves described by a spherical pendulum."

J. K. Whittemore: "Spiral minimal surfaces."

J. R. Kline: "Concerning the complements of countable infinities of point sets of certain types."

L. L. Dines: "On projective transformations in function space."

C. C. Grove: "Foundation of the correlation coefficient."

O. E. Glenn: "Preliminary report on invariant systems belonging to domains."

Norbert Wiener: "Certain formal invariances in Boolean algebras."

L. P. Eisenhart: "Theory of transformations T of conjugate systems."

E. V. Huntington: "Complete existential theory of the postulates for serial order."

E. V. Huntington: "Complete existential theory of postulates for well-ordered sets."

Daniel Buchanan: "Orbits asymptotic to an isosceles-triangle solution of the problem of three bodies."

Daniel Buchanan: "Asymptotic satellites about the straight-line equilibrium points."

Daniel Buchanan: "Asymptotic satellites about the equilateral-triangle equilibrium points."

G. M. Green: "Isothermal nets on a curved surface."

A. L. Miller: "Systems of pencils of lines in ordinary space."

W. L. Hart: "On an infinite system of ordinary differential equations."

W. L. Hart: "Linear differential equations in infinitely many variables."

E. V. Huntington: "A set of independent postulates for cyclic order."

E. V. Huntington: "Sets of independent postulates for order on a closed line."

Frank Morley: "The cubic seven-point and the Lüroth quartic."

J. L. Coolidge: "The intersections of a straight line and hyperquadric."

A. D. Pitcher: "Biextremal connected sets."

H. H. Mitchell: "Proof that certain ideals in a cyclotomic realm are principal ideals."

H. H. Mitchell: "On the asymptotic value of sums of power residues."

Edward Kasner: "Certain systems of curves connected with the theory of heat."

Teresa Cohen: "On a concomitant curve of the planar quartic."

P. F. Smith: "A theorem for space analogous to Cesàro's theorem for plane isogonal systems."

W. E. Story: "Some variable three-term scales of relation."

E. W. Brown, Presidential address: "The relations of mathematics to the natural sciences."

A. O. Leuschner, Vice-presidential address, Section A: "Derivation of orbits—theory and practise."

G. D. Birkhoff: "A class of series allied to Fourier's series."

G. D. Birkhoff: "Note on linear difference equations."

G. A. Miller: "Groups generated by two operators of the same prime order such that the conjugates of the one under the other are commutative."

H. S. Vandiver: "On the power characters of units in a cyclotomic field."

Henry Taber: "On the structure of finite continuous groups."

The San Francisco Section of the society held its twenty-eighth regular meeting at the University of California on November 25. The Southwestern Section held its tenth regular meeting at the University of Kansas on December 2. The seventh regular meeting of the society at Chicago was held on December 22–23. The next meeting of the society will be held at Columbia University on February 24.

F. N. COLE,
Secretary

THE AMERICAN GENETIC ASSOCIATION

THE thirteenth annual meeting of the association was held at Columbia University, December 26–28, with an attendance of about 200. In the presidential address on "The Importance of Photographs in Presenting Genetic Discoveries," Dr. David Fairchild insisted that men of science should take more pains properly to record the results of their investigations by photographs; that such photographs as are commonly published are too small and also fail to make the desired impression because too little allowance is made for the reader's point of view. He showed lantern slides to illustrate his remarks.

Professor E. E. Barker, of Cornell University, presented the results of a questionnaire sent to American colleges, which showed great diversity in the amount of attention given to genetics, and the side from which it is approached.

In discussing "The Biological Significance of Death" Professor F. H. Pike, of the College of Physicians and Surgeons, Columbia University, referred to the independence of the environment which higher forms of life have attained, mainly through the property of regulation. This independence has made differentiation possible, but the individual has also become incapable of any great change. If evolution is to take place, it must then depend on the variations accompanying the production of new individuals. The immortality of the older forms would produce a congestion of the earth which would seriously interfere with the development of the newer. Death is therefore to be regarded as an adaptation, as Weismann supposed, which furthers evolution.

"The Constructive Aspect of Birth-Control" was discussed by Professor Robert J. Sprague, of Massachusetts Agricultural College. He observed that birth-control is only a part of the larger problem of population; that the poorer classes need to practise more birth-control but the more efficient classes need to practise distinctly less than they do at present, if the race is to evolve progressively. A constructive program of economic and social changes, which would help to make fecundity correlated with eugenic value, was outlined.

Professor W. S. Anderson, of the University of Kentucky, spoke on "Some Difficulties in Breeding Blooded Stock." The production of blooded horses is particularly hindered by the infertility of brood mares, which in different parts of Kentucky runs from 35 per cent. to 65 per cent. Investigation has proved that the difficulty usually is to be found in the mare, rarely in the stallion, and by hygienic measures the fertility of mares on the Patchen Wilkes stock farm has been doubled. Selection of fecund strains is believed, however, to be necessary for complete removal of the difficulty of infertility.

As chairman of the committee on research in eugenics, Dr. Frederick Adams Woods, of the Massachusetts Institute of Technology, presided at the second meeting and read a paper on "Significant Evidence for Mental Heredity." Much of the evidence commonly cited he believes to be worthless, but by measurements of differences it is possible to get acceptable proof. Studies of twins by Galton and Thorndike, and those of the royal families of Europe by the speaker himself, were cited. Princes who inherited thrones were not found to be more conspicuous mentally than their younger brothers, despite the greater chance which a monarch has for displaying any valuable traits he may possess. Moreover, eminent men are found to be as much interrelated in America as in Europe, although it is popularly supposed that superior opportunities and free competition in a newer country make family connections of less value. The fact that eminent men are found, despite this, to be much interrelated indicates that their mental differences are germinal and not solely the result of educational and social influences.

Mary L. Read, director of the School of Mothercraft, New York City, had the topic "Eugenics

and the Education of Young Women.'' She emphasized the necessity for sex-differentiation in education, for the teaching of mothercraft, and described her own work in this connection.

Professor Roswell Hill Johnson, of the University of Pittsburgh, discussing ''The Eugenic Aspect of Sexual Immorality,'' pointed out that sex offenders, for a variety of reasons, have a lower birth-rate than do moral people. Further, he argued that the sexually immoral as a class are eugenically inferior to the more socially-minded part of the population. It follows that sexual immorality is a eugenic agency, tending to reduce the racial contribution of an inferior class. Campaigns for sex-hygiene, then, can not be considered directly eugenic; on the contrary, they will have some dysgenic result, which should be counteracted by appropriate eugenic measures.

Professor Robert DeC. Ward, of Harvard University, considered ''The War in Relation to Eugenics—a Problem for the United States.'' He expects a large immigration of an undesirable class after the war, and described the need for some such law as that now pending in Congress, to shut out such arrivals as are biologically inferior.

Arthur H. Estabrook, of the Eugenics Record Office, told of ''A Field Survey of Mental Defectives in Two Counties in Indiana.'' Only the feeble-minded, insane and epileptic were considered; in one county the proportion of defectives was found to be 19 per 1,000 population, and in the other 11.4.

As vice-chairman of the committee on research in plant-breeding, G. N. Collins, of the Bureau of Plant Industry, presided over the third meeting. Adolph E. Waller, of Ohio State University, explaining ''Xenia and Other Influences Following Fertilization,'' showed that xenia, properly defined, was limited to the result of triple fusion in the endosperm of angiosperms. He suggested the name *ectogony* to cover the various other phenomena now wrongly included under the name of xenia—such phenomena as are represented by the common belief that the sugar content of watermelons is reduced if the flowers have been pollinated by pumpkins.

Donald F. Jones, of the Connecticut Experiment Station, reported on ''The Effect of Heterozygosis upon the Time of Maturity.'' As one expression of hybrid vigor, he cited a cross of two varieties of tomatoes which showed a constant small difference in time of production of fruit during four years in which they were grown. Four F_1 generation crosses between these varieties grown during four different years with their parents and compared with them had approximately the same time of production as the earlier parent. The same condition was observed in a cross between an early and a late variety of sweet corn. In a large number of crosses between inbred strains of dent maize there was a tendency to hasten the average time of flowering and maturing of the crosses as compared with their parents. The conclusion was drawn that heterozygosis may not only increase size but also permit of the production of that increased size in less time, hence greatly increasing the rapidity of growth. In respect to the time to complete growth, heterozygosis does not effect a result comparable to that produced by environmental factors, since, usually, external conditions which result in an increase in growth tend to delay maturity.

C. W. Moore, of Cornell University, described some ''Studies in Semi-sterility'' on *Tradescantia*, Alsike Clover, Alfalfa and Shirley Poppy. Results favored Compton's hypothesis that self-sterility in plants is analogous to rust-immunity in wheat. By this view it is supposed that the pollen-tube in a cross continues to grow in order to get adequate food supply; while in self-pollination the nutritive conditions are more favorable, the pollen-tube does not have to elongate much, and it therefore does not grow enough to permit fertilization.

J. B. Norton, of the Bureau of Plant Industry, described 10 years of asparagus breeding on Cape Cod, disease resistance being the primary object. Remarkable success has been secured, by hybridization and selection, in getting disease-resistant and highly productive varieties.

Professor C. E. Myers, of Pennsylvania State College, reported on ''Some Preliminary Experiments in Cabbage Breeding.'' All characters hitherto tested in cabbage have appeared to blend in heredity, but it is believed that this is due to the mongrel nature of the stocks. When varieties were inbred for a few generations, and then crossed, segregation was observed.

Professor H. H. Love, of Cornell University, spoke on ''Some Results obtained from Certain Crosses of *Avena*.'' One probable case of linkage has been found.

Five papers were read by title only. The last session of the association was a joint one with the Botanical Society of America. The next meeting will be at Pittsburgh, December 28–30, in accordance with the plans of the American Association for the Advancement of Science.

Paul Popenoe,
Secretary pro tem.